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sums necessary for the setting up of the normal equations, which are then solved directly. The only check on the correctness of our calculations that is necessary is the assurance that we have copied our numbers accurately. The author shows that these tables may be applied only in cases where the number of judgments on our comparison stimuli are 25, 50, 100 or multiples of these, as the probabilities are calculated only to two decimal places. He also goes into a consideration of the accuracy of the final determination of the constants h and c , in view of the number of decimal places retained in our products.

The value of these tables can not be overestimated, as the experimental procedure of the method of constant stimuli has been so standardized that, it seems to the reviewer, with a little care and foresight, no case should occur where the tables cannot be applied to the results. An entire calculation for a series of seven comparison stimuli with the help of these tables will require only about 15 to 20 minutes; and with practice even this time may be shortened. Indeed, the reviewer has seen an entire calculation for such a series completed in less than 10 minutes. Such a calculation can not be effected in less than an hour with the help of an adding machine or any of the large multiplication tables; and even more time than this is required when using logarithms for obtaining these products. Furthermore, the chance of committing errors of calculation is very much reduced by the use of these tables. Thus, with their publication, it seems to the writer that the method of constant stimuli has become the most practical of any of the psychophysical measurement methods. With this method alone, the subject has no knowledge of the objective relation of the stimuli, which knowledge may cause an error of expectation. The theory underlying this method is probably better known than that for any of the others. The one argument against the use of the method of constant stimuli has been that the calculations required were lengthy and cumbersome; now, with the publication of these tables, this final difficulty has been removed.

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The Consciousness of the Universal. By FRANCIS AVELING. London, Macmillan and Co., 1912. pp. x, 255.

Aveling has made a descriptive experimental study of the presence in consciousness of the universal idea. Such questions as the growth of meaning, the nature of abstraction, the existence of a thought element in meaning, and the relation of imagery to thought are examined; explanatory hypotheses and suggestions are added; and the book includes an historical sketch of seventy-two pages.

The experimentation was divided into two parts. In the first, Aveling attempted to arrange conditions under which meanings should be formed and become associated with nonsense words. The method consisted essentially in the systematic presentation to trained observers of ten sets of small pictures, with ten corresponding nonsense words,—the pictures representing familiar objects, such as carpenters' tools, musical instruments, etc., and each set being sufficiently homogeneous to justify its being grouped under one name. The words were then presented alone, and introspections obtained on the appearance in consciousness of the meaning which the word had acquired from its association with the pictures. The results were as follows: 1. Four stages were distinguished in the growth of meaning, ranging from an initial stage in which the words had not yet acquired meaning, but

served merely as antecedents to the revival of a visual image of one of the pictures, usually of the one shown during the sitting at which the introspection was taken, to a final stage in which the stimulus word could hardly be discriminated from its meaning, with which latter no imagery was discovered. These four stages were often not clearly marked, any one being sometimes exaggerated, sometimes short-circuited, by an observer. 2. Abstract, imageless mental contents are present in thinking. Visual imagery, the presence or absence of which was the most striking feature of the protocols, varied from time to time, and after a few experiments underwent changes which Aveling characterizes as 'blurring,' 'becoming vague'; yet at the same time the observers reported certain knowledge of meaning. Meaning is not a product of images alone, nor in combination; to enter into meaning, the image must be present *as* something, *i. e.*, as subsumed under a concept. The strong and growing association obtains between the word and the concept under which the pictures and their images are subsumed. Such concepts are imageless, and they are present in all meanings; they are mental elements, irreducible to any form of imagery. Their presence is indicated by the appearance in the protocols of such expressions as 'knew what it meant,' 'had idea of,' etc., absence of imagery being sometimes asserted by the observer. These imageless concepts 'must have been abstracted from the pictures with which the word was learned;' and from the fact of the existence in the percept of both sensorial and conceptual elements, Aveling argues that there are two kinds of abstraction, sensorial,—or the envisagement of a sensorial element apart from accompanying sensorial elements,—and conceptual,—or the abstraction of the 'ideational concept or imageless thought content' from the sensorial elements for which it may come to stand in consciousness. 3. Regarding the relation of imagery to thought, Aveling advances the following hypothesis, adducing in its support excerpts from the introspections of his observers, with interpretations and arguments: The main associations, and only necessary ones, in thought processes obtain between pure concepts and the conceptual elements of images. Where images are revived, in so far as they may be regarded as purely sensorial, they are revived by reason of a conceptual element in virtue of which alone they can become present to consciousness as images. The purely sensorial elements may in many cases be considered as by-products of the conceptual elements with which they occur in consciousness. The function of imagery is to impart stability to the concept. Moreover, thought deals with things; and the presence of things in consciousness is characterized by the sensorial content. The genesis of the concept cannot be explained without sensorial implications; and the close association between the two in perception gives rise to the tendency observed for the concept to reproduce imagery.

In the second part of the experiment, Aveling investigated the functioning in judgments of the ten words with their acquired meanings. The method consisted in the presentation of the word, orally or visually, with a modifier and verb, the observer being asked to supply a predicate. By using different modifiers,—'all,' 'no,' 'the first,' etc.,—it was aimed to induce respectively three sorts of meanings,—affirmative and negative universal, and particular. The observers were asked to give an introspective description of the meaning of the subject and predicate, and especially to note whether the meaning of the subject had a general or particular reference in consciousness. Aveling found that universal meanings tend to be present as concepts, in pure form or accompanied

by imagery, while in particular meanings imagery is prominent. He expresses the belief that imagery which accompanies particular reference is more clear and vivid than that which accompanies universal meanings. Exceptions appeared, in that imagery was prominent with universal meanings in twenty per cent. of cases, and concepts were reported with individual meanings in four per cent. of cases. The first is accounted for on the ground that imagery appeared when thought was baffled, or occurred as representing pictures that would not fit the concept employed; also that concepts were overlooked by the observer in many cases where their presence is clearly to be inferred (131-132; 177, footnote). In discussing the four per cent. of cases where concepts were reported in individual meanings, Aveling maintains that the meanings were not truly particular, and that vague images were overlooked (188; 190; 254). The meaning of the subject may be accompanied by awareness of no reference to one or more pictures; by conscious reference to everything that could be included in the word; and by conscious reference to all or some of the pictures associated with the word. Such reference Aveling calls 'conceptual overknowledge;' and he regards it as a separate conceptual element, forming a fusion with the meaning content, for the reason that it is described by the observers in the same terms as those used in describing concepts,—'awareness of,' 'idea of,' etc. The meaning of the predicate, which may appear as a concept, occurs sometimes before, sometimes with, the word that expresses it. The former is more likely to be the case with universal, and the latter with particular judgments. Aveling is uncertain as to the explanation of this, but suggests that imagery, prominent in individual subjects, may 'conflue' into the predicate, and strengthen the tendency of a word-image to appear with it.

Aveling's method is in many respects an improvement upon methods of previous investigators in this field. As he himself points out, it induces the transfer of a meaning already formed to a new symbol, and not the formation of a meaning itself. In the opinion of the reviewer, Aveling's introspective findings do not justify his conclusion that the imageless concept is invariably present in the thought processes; nor, indeed, do they warrant the statement that the imageless concept exists. In many instances the author has allowed himself an unwarranted liberty in interpreting his protocols in favor of the conceptual element. For example, on pages 186 and 187, the statement appears that "We have . . . to record the presence of imagery noted by our observers as giving the meaning of the subject in all three forms of judgment." A few lines on, and on pages 110, 131f, and 202, we read that failure of the observers to mention concepts does not establish their absence, and that "concepts were *de facto* present and operative, but they were not reported by our observers." In dealing with the individual meanings, where imagery should have been present, but was not recorded, the author states (254): "We are quite confident" that these cases are to be explained "by the presence of kinaesthetic sensations, which we have frequently observed in ordinary life as giving 'individual' meaning to words." Again, on page 148f, in discussing his theory of concepts, Aveling remarks, among other things, in answer to the possible objection that failure to report images is no certain indication of their absence, that "the absence of mention of images in a very considerable number of the protocols . . . is to be taken rather as a strong indication of their absence than otherwise; since in other cases images were duly noted and reported by the same observers." If vague sensorial contents are assumed in

a few cases, why not in more? And on what grounds can an investigator allege the presence of a content, not noted in a very considerable per cent. of his introspections? Aveling nowhere describes the concept; and his treatment of it as a phenomenological content demands either its description, or proof of its unmistakable recognition by the observers as co-elemental with such factors as sensation and affection.

In many cases there seems to be evidence that the supposed concept is a product of the observer's inability at the time to analyze or even describe his mental content; the introspective descriptions are often vague and indefinite, and even self-contradictory. This appears especially in the following introspection, and those following it: "I had a distinct memory idea* of a hammer, with no image and no word, 'Goral'"—the nonsense word—"was in consciousness at the time, but did not express the hammer. They co-existed co-ordinately. The idea of hammer was localized above the stimulus word" (98-99). What can an introspector mean when he states that he has an *imageless idea* of a hammer, and adds that this imageless idea is *definitely localized in space*? It would appear that Aveling and his introspectors employ the terms 'imageless' and 'idea' in a wholly novel sense. The introspections and arguments advanced (especially 111-112) do not seem sufficient to establish the validity of the statement that images and their combinations are, of themselves, meaningless.

Again, in discussing 'conceptual overknowledge,' Aveling does not do justice to the fact that he had explicitly asked his observers to watch for particular or general reference (203). The treatment of imagery, from the point of view of its relative clearness in particular and universal meanings, is confessedly inadequate (189-190). The author apparently considers only two alternative modes of conscious representation of meaning,—more or less concrete visual or auditory imagery on the one hand, and the imageless concept, on the other (103 f); and of these two alternatives he accepts the latter. The possible significance of kinaesthetic attitudes, determining tendencies, activity consciousnesses, affective tonings, etc., is largely neglected. We must, then, conclude that additional data are needed, before the existence of the abstract, imageless concept, as postulated by Aveling, can be established.

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Conditioned Reflexes Excited by Visual Stimuli in the Dog Following Extirpation of the Occipital Lobes. Thesis for the degree of Doctor of Medicine. By N. K. TOROPOFF. From the physiological department of the Imperial Institute for Experimental Medicine. St. Petersburg, 1908.

Dr. Toropoff points out the lack of precise experimental data concerning the functions of the occipital lobes in higher vertebrates and the resulting divergence of views held by various physiologists. This state of things he is inclined to attribute largely to a fatal shortcoming common to all previously employed methods of investigation, namely, the circumstance that in all of them the sole criterion of the influence of a stimulus of any kind upon the nervous system of an animal is more or less complicated motor reaction. Thus in studies

*The terms 'idea,' 'ideopresentation,' are consistently used by Aveling in the sense of imageless contents of conceptual nature, cf. 97, 109, et al.